CONTAINER WITH SNAP-ON CLOSURE

Description

Field of the invention

The invention relates to a container suitable for the aseptic packing of microbiologically sensitive food products.

Background to the invention

Many food products are prone to microbiological spoilage. Such products are herein designated as microbiologically sensitive food products. Microbiologically sensitive food products will have a restricted shelf life when not properly preserved. Commonly such products are treated to eliminate the relevant microbial load using for instance pasteurisation or sterilisation. In order to prolong the shelf life of pasteurised or sterilised products, methods of hygienic or aseptic packaging the food products have been developed.

For non-carbonated liquid or pourable microbiologically sensitive food products, such as for instance milk products, fruit juices etc. several ways of aseptic packaging are known.

J. Goursaud describes in Food Packaging Technology, Vol. 2, Chapter 35, Editors G. Bureau and J.-L Multon, VCH Publishers Inc. (1996) methods of aseptic packing of milk products. Some commercial methods such as Tetra Brik, Aseptic Combiblock and Elopak use a cardboard laminate structure to form a container, which is sealed after filling with sterilised milk. Other methods, such as those developed by Bottle-pack, Remy, Serac and Erca use plastic containers. The plastic containers are closed using a heat sealed aluminium foil (tin foil) or a screw

cap. For yogurts, jars and goblets may be used that are usually heat-sealed with (aluminium) foil (tin foil).

One requirement for aseptic packaging is that the packaging is tamper-proof or provides evidence of tampering as it may occur in a shop. A heat-sealed foil shows that tampering has taken place, since the foil is disturbed/damaged when tampered with . Screw caps may be provided with a ring or a break-lock that is torn off or broken when the container is opened for the first time.

The known closures for the aseptic packages have a number of disadvantages. Heat-sealed aluminium foils cannot be re-closed, so therefore an additional screw cap is often added when reclosability is desired. Moreover an aluminium foil (tin foil) is vulnerable. The screw cap needs to be unscrewed to open the container and re-applied after use, which may be difficult in use. Further a screw cap will be separated from the container after opening and may than get lost and is prone to fouling.

It is known to use blow-moulded containers for aseptic packaging using injection moulded preforms. EP 1122168 describes a method for moulding and filling aseptic containers. The method comprises the steps of sterilising preforms, heating the sterilised preforms to a temperature appropriate to orientation, moulding the heated preforms into containers by an orientation blow moulding process, filling the moulded containers with an aseptic liquid and hermetically closing the filled containers each with an aseptic closure. The containers are capped with sterilised caps, which are not described in detail.

CH 595255 describes a sterile closable container with a snap-on cap, suitable for packing liquid or solid pharmaceuticals. The container is tamper-proof, see column 2, lines 25-31 and is reclosable. The container is hermetically closed since tap 12 is forced into the neck 9 of the container and the upper rim 8 of the cylindrical upper part of the container is forced into the ring-shaped recess 13. As a result of this construction, a relatively high amount of material is used in the cap, further the cap is only suitable for closing small diameter necks. The top of the neck of the bottle has to be very accurately dimensioned otherwise the bottle will not be aseptic. The press-on force for snapping on the cap is also high. Further the described bottle is preferably of glass, which will result in a container having a high weight.

FR 2744100 describes a snap-on closure, comprising a peripheral skirt with a ridge, intended for engagement with the inner surface of the neck wherein the free outer diameter of the ridge is slightly higher than the free inner diameter of the neck. The closure shows tamper evidence, see the tear-off strip 4. It may be opened using one hand after the tear-off strip has been removed. No use for aseptic packaging has been described in FR 2744100.

WO 99/61337 describes a plastic bottle comprising an extrusion blow-moulded body and an injection moulded neck and cap assembly, wherein the cap is fitted to the neck in order to provide a leak free resealable closure. The closure is sealed with a foil (70). This bottle has the same disadvantages as described above for other foil-sealed closures. Moreover according to WO99/61337 a separate step to connect the neck and cap assembly to the container body is needed.

Summary of the invention

It is therefore an object of the invention to provide a container suitable for the aseptic packing of microbiologically sensitive food products. Another object of the invention is to provide a container with a closure that may reliably be reclosed after initial opening. A further object of the invention is to provide a container with closure that is tamper-proof or shows tamper evidence. Another object of the invention is to provide a container with closure that is light in weight. Other objects are to provide a closure that has a low snap-on pressure, that is easily recyclable and that has a simple construction. Still another object of the invention is to provide a container with closure that may be reliably opened and closed after initial opening using one hand and remains connected to the container after opening.

One or more of these objects are attained according to the invention in that the container comprises an injection blow-moulded container body (1) and neck (2) and a closure (3), characterised in that the closure (3) is a snap-on closure (3).

Detailed description of the invention

The closure of the container according to the invention is a snap-on closure. This means that the closure according to the invention is to be pressed onto the neck of the container after the container has been filled to achieve an aseptic seal. This is opposed to sealing with foil, crown cork or turning on a screw cap as disclosed in the prior art. According to the invention a mechanically easy sealing of the container is achieved and the weight of the container and closure is low.

The details of the invention will be illustrated by the following description of a preferred embodiment, by way of example only, with reference to the accompanying figures.

Figure 1: Vertical section of the top part of a container and the snap-on closure according to the preferred embodiment

Figure 2: Section of circumferential part of snap-on cap showing web (8)

Figure 3: Enlarged bottom plan view of the snap-on closure

Preferably the snap-on closure (3) comprises a peripheral skirt (4) with a ridge (5), intended for engagement with the inner surface (6) of the neck (2) wherein the free outer diameter of the ridge (5) is slightly higher than the free inner diameter of the neck (2), and the snap-on closure (3) and the neck (2) comprise means (7,8,9,10) for substantially fixing the ridge (5) in the axial direction of the neck (2), when the container is closed.

Preferably a number of webs (8) extending from the top of the closure in the direction of the top rim of the neck fix the ridge in the downward direction. These webs (8) have such a height that the bottom touches the top rim of the neck when the snap-on closure (3) is snapped onto the container body.

In a preferred embodiment as shown in Fig. 2, a protrusion (7) of the neck (2) lies against an inclined part (10) of the bottom part of the closure (3), which prohibits a downward movement of the ridge (5), whereas a web (8) lies against the

upper ridge (9) of the neck (2), which results in a fixation of the ridge (5) in upward direction.

Closing a container filled with sterile product in the way described above provides a commercially aseptic packed product.

Preferably the tolerance of movement of the ridge (5) in the axial direction of the neck, when the container is closed, is smaller than the height (H in figure 5) of the contact surface between the ridge (5) and the inner surface (6) of the neck (2).

Advantageously the neck (2) has an inner surface (6), having no grooves having a width of 0.5 µm or larger. These measures will further reduce the risk of microbiological contamination.

The closure according to the invention is made from plastic material that is injection moulded. The container is made preferably in two steps. In the first step a preform is produced by injection moulding, this assures a high accuracy in the neck of the container. The preform is designed as such that the seal area cannot be touched by other preforms during handling and transport from preform injection to Blow moulding. In a subsequent step, the container body is shaped by blow-moulding. The seal area inside of the preform neck will not be touched by any object to avoid scratches. The seal area is the part of the inner surface (6) of the neck (2) that is in contact with the ridge (5), when the container is sealed. The Blowing, Sterilisation, Filling and Capping operation are to be executed preferably in one operation avoiding any mechanical contact between the inner surface of the neck and the equipment. The above-described process ensures an accurate smooth inner surface without scratches from handling.

Preferably the Shore D hardness of the material of the ridge (5) is lower than the Shore D hardness of the material of the neck (2). This causes that the material of the ridge may easily fill any grooves in or surface roughness of the inner surface of the neck, resulting in an improved sealing of the container. The Shore D hardness of the material of the ridge (5) is preferably 65 or less, more preferably 60 or less and the Shore D hardness of the material of the neck (2) is preferably 70 or more, more preferably 80 or more.

The Shore D hardness may be measured with an apparatus known as a Durometer and consequently is also known as 'Durometer hardness'. The hardness value is determined by the penetration of the Durometer indenter foot into the sample. Because of the resilience of rubbers and plastics, the indentation reading my change over time - so the indentation time is sometimes reported along with the hardness number. The ASTM test method designation is ASTM D2240 00, which is used herein. Related methods include ISO 7619 and ISO 868; DIN 53505; and JIS K 6301, which was discontinued and superseded by JIS K 6253.

Though the material of the ridge is most relevant for the sealing and it may be different from rest of the material of the snap-on closure, it is preferred that the whole snap-on closure, including the ridge, is made of the same material, for reasons of simplicity and recycleability.

Suitable materials for the container body are resilient plastic materials that may be injection-blow-moulded, such as Polyethylene terepthalate (PET), polycarbonate (PC) or PEN, or mixtures thereof.

Suitable materials for the snap-on closure are plastic materials that may be injection moulded such as various types of polyethylene, for example linear-low density polyethylene (LLDPE).

Preferably the snap-on closure has a hinge (11). This allows the container to be opened using one hand, after initial opening and removal of the tear-strip. Advantageously the hinge (11) is a click-hinge (11), which is even more comfortable in use, since it fixes the closure in two positions, opened and closed.

Preferably the snap-on closure comprises a circumferential tear-off strip (12). This tear-off strip provides evidence of tampering. The tear-off strip may preferably be supplied with a grip (13).

Preferably the container is a bottle, but the invention is not limited to bottles. Other containers such as jars, goblet, etc. may also benefit from the invention.

The invention is only related to food products, which are not required to be packed under pressure, so that the packing of e.g. carbonated beverages is excluded.

After the container and closure have been prepared, they are preferably sterilized, e.g. by spraying with desinfectant liquid (for example a 4.5 wt% Oxonia, Henkel Ecolab Germany) and subsequent rinsing with sterilised water. Any other sterilising method may also be used.

After sterilisation, the container is filled with a food product and is sealed by pressing on the sterilised snap-on closure.

The invention further relates to a container as described herein filled with a sterilised or pasteurised microbiologically sensitive food product. The container according to the invention is especially suitable for microbiologically sensitive food product has a pH between 6 and 8.

The microbiologically sensitive food product may have any state or appearance: it may be a liquid, a pourable material, a spoonable or spreadable material or solid paste or particles. Preferably the food product is a liquid, squeezable or pourable product.

Example

Containers with snap-on closure having a volume of 250 ml according to figures 1-3 were made. The material of the container was polyethylene terephtalate (PET) suitable for biaxial blown-moulding, having a Shore D hardness of 83. The material of the snap-on closure was linear low-density polyethylene (LLDPE) having a Shore D hardness of 53.

Preforms were prepared by injection-blowmoulding. Snap-on caps were injection moulded.

Preforms were fed into a Husky blow-moulding machine and the preforms were blow-moulded whereby the neck of the preforms was only held on the outside.

The resulting bottles and the snap-on caps were sterilised by means of Gamma-irradiation. After desinfection they were kept in a sterile environment until closure of the bottles with the snap-on caps.

The bottles were filled with sterilised cream and were closed with the snap-on caps in a high hygiene environment. A sleeve (oriented polystyrene foil) was shrunk around the bottle covering the body and the neck of the bottle, including the fixation ring of the cap under the tear-off strip, but not the cap.

The aseptic containers thus prepared were tested as follows.

Test of the aseptic containers

The top of 32 bottles produced as described above, were sprayed with a fresh culture of Serratia marescens using a chromatography atomiser (approximately 2 ml of 10E9 bacteria/ml). The spraying was repeated during 2 consecutive days. After each treatment, the sprayed bottles were incubated at 30°C, in total for 6 days.

All samples were investigated microbiologically by dissemination on Plate Count Agar and no Serratia marescens or any other bacteria was found in any of the 32 containers. A repetition of this test with another batch of 32 bottles resulted again in that no spoilage was found in any of the 32 containers.

As a blank test 4 bottles were opened and inoculated with the Serratia marescens culture. Strong growth occurred within 2 days at 30°C and resulted in visible deterioration of the cream.

Claims

1. Plastic container suitable for aseptic packaging of microbiologically sensitive food products comprising an injection blowmoulded container body (1) and neck (2) and a closure (3), characterised in that the closure (3) is a snap-on closure (3).

2. Container according to claim 1, wherein the snap-on closure (3) comprises a peripheral skirt (4) with a ridge (5), intended for engagement with the inner surface (6) of the neck (2) wherein the free outer diameter of the ridge (5) is slightly higher than the free inner diameter of the neck, characterised in that the snap-on closure (3) and the neck comprise means (7,8) for substantially fixing the ridge (5) in the axial direction of the neck, when the container is closed.

3. Container according to claim 2, wherein the tolerance of movement of the ridge (5) in the axial direction of the neck, when the container is closed, is smaller than the height of the contact surface between the ridge and the inner surface of the neck.

4. Container according to any of claims 1-3, wherein the neck has an inner surface (6), having no grooves having a width of 0.5 μm or larger.

5. Container according to any of claims 1-4, wherein the Shore D hardness of the material of the ridge (5) is lower than the Shore D hardness of the material of the neck (2).

6. Container according to claim 5, wherein the Shore D hardness of the material of the ridge (5) is 65 or smaller

and the Shore D hardness of the material of the neck (2) is 70 or higher.

7. Container according to any of claims 1-6, wherein the container is provided with a foil around the bottle covering large part of the body and the neck of the bottle, but not the cap.

8. Container according to claim 7, wherein the foil comprises oriented polystyrene.

9. Container according to any of claims 1-8, wherein the snap-on closure has a hinge (9).

10. Container according to claim 9, wherein the hinge (9) is a click-hinge (9).

11. Container according to any of claims 1-10, wherein the snap-on closure comprises a circumferential tear-off strip (10).

12. Container according to any of claims 1-11, wherein the material of the ridge substantially consists of linear low-density polyethylene (LLDPE).

13. Container according to any of claims 1-12, wherein the container is a bottle.

14. Container according to any of claims 1-13 filled with a sterilised or pasteurised microbiologically sensitive food product.

15. Container according to claim 14, wherein the microbiologically sensitive food product has a pH between 6 and 8.

Abstract

The invention relates to a container suitable for aseptic packing of microbiologically sensitive food products comprising a blow-moulded container body (1) and neck (2) and a closure (3), characterised in that the closure (3) is a snap-on closure (3).

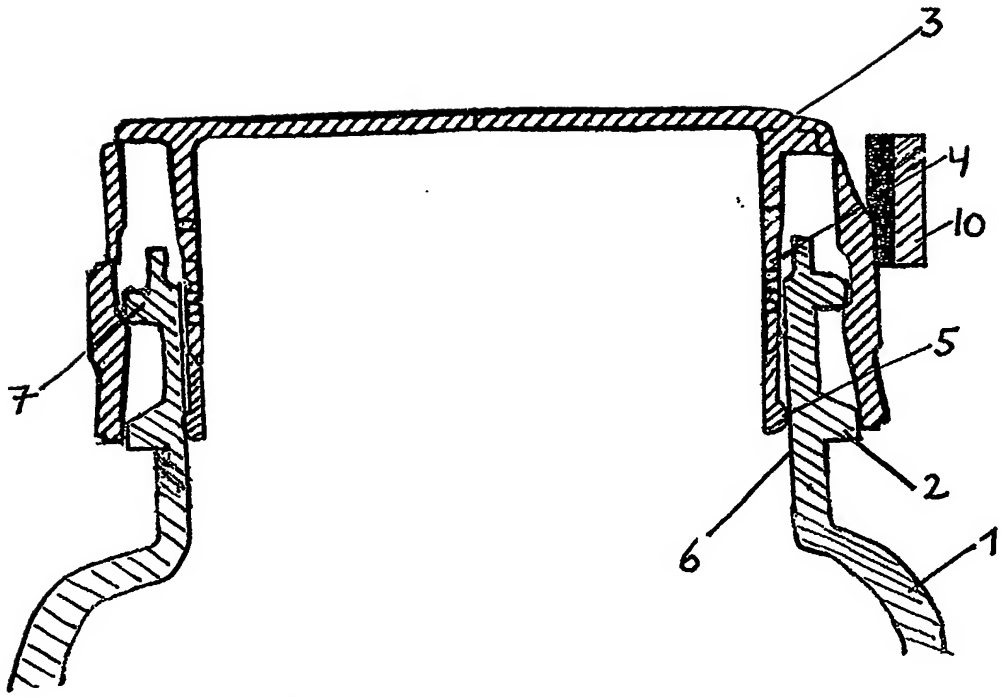

FIG. 1

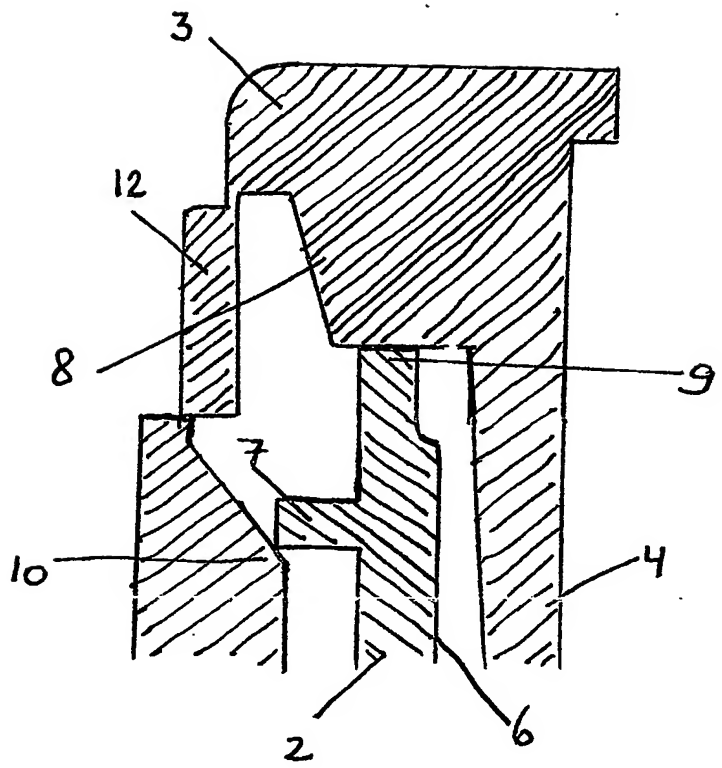

FIG. 2

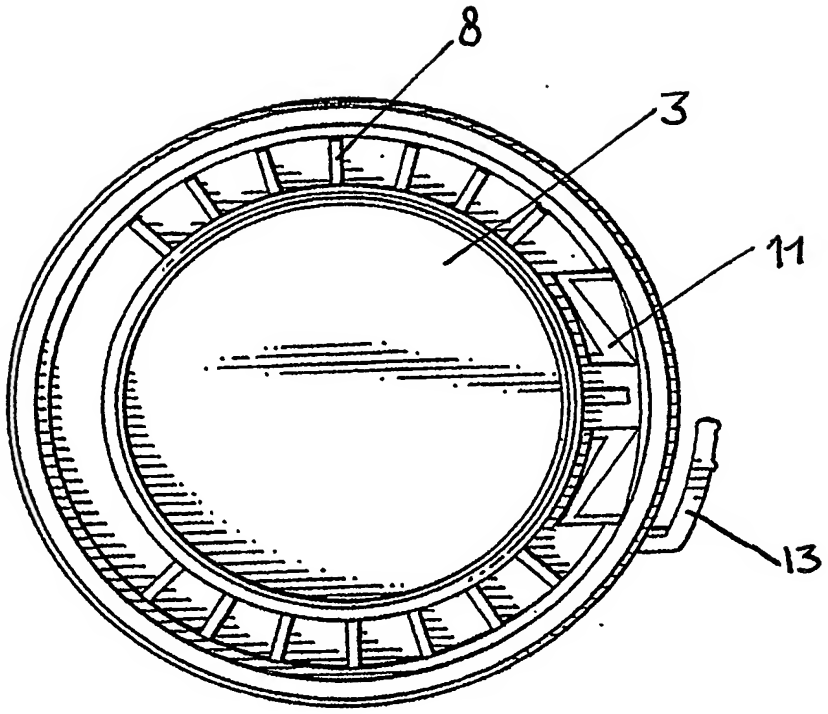

FIG. 3